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The Sawfly Genus *Pleroneura* (Hymenoptera, Xyelidae) in East Asia[1)]

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Abstract East Asian species of the xyelid sawfly genus *Pleroneura* are revised and four species are recognized, three being new to science: *P. piceae* SHINOHARA et Hara, sp. nov., from Hokkaido, Japan, *P. subulata* SHINOHARA, sp. nov., from Honshu, Japan, and Korea, *P. hikosana* TOGASHI, 1972, from Kyushu, Japan, and *P. atra* SHINOHARA, NAITO et HUANG, sp. nov., from southeastern Tibet. General account of the genus and a key to the East Asian species are given.

Key words: Hymenoptera; Xyelidae; *Pleroneura*; systematics; East Asia.

Sawflies of the genus *Pleroneura* are rather small, obscurely colored insects belonging to the family Xyelidae, which is generally considered to be the most "primitive" group among the Recent Hymenopterans. The adults of *Pleroneura* are separated from those of the other xyelids by the short apical filament of the antenna, short Sc vein in the forewing with both the branches Sc1 and Sc2 distinct, the Sc2 vein joining R vein before the separation of Rs vein, elongate stigma, which is about as long as the 2r crossvein, and rather narrow, apically pointed sawsheath. The known larvae are shoot-borers in firs and spruces.

The species of this genus were little known until recently mainly due to their great rarity and lack of distinctive characters useful for species recognition. SMITH (1978) catalogued eight world species, five occurring in the Nearctic Region and three in the Palearctic. Acquiring much material for morphological and biological studies, SMITH *et al.* (1977) established a well-founded classification for the Nearctic fauna. Our knowledge of the Palearctic species, on the other hand, still remains poor and fragmentary.

In Europe, two closely similar species, *P. dahlii* (HARTIG, 1837) and *P. coniferarum* (HARTIG, 1837), are known but from scattered material. SCHEDL (1978), in a recent review of the European Xyelidae, commented that the distinctiveness of the two species should be ascertained when more material becomes available, almost repeating the remarks made by ENSLIN (1917) over 60 years before. The taxonomic status of *P. numidica* BENSON, 1940, from Algeria was also problematical. It was synonymized with *P. coniferarum* by

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BERLAND (1943), but BENSON (1945) treated it as a good species. Judging from the illustrations and comments published by BENSON (1940) and BERLAND (1947), however, it seems reasonable to me to recognize three distinct species in the western Palearctic distinguishable by the relative length and shape of the sawsheath, which are, as shown by SMITH *et al.* (1977) for the Nearctic species, very useful features for separating species of *Pleroneura.* The western Palearctic species thus recognized are *P. dahlii* with a short and slender sawsheath (fig. 1 in BENSON, 1940), *P. coniferarum* with a short and robust sawsheath (fig. 21 in BERLAND, 1947), and *P. numidica* with a long sawsheath (fig. 2 in BENSON, 1940).

In East Asia, TAKEUCHI (1938) recorded "*P. dahli*" from Hokkaido, Japan, and North Korea, and TOGASHI (1972 a) described *P. hikosana* from Kyushu, Japan. OKUTANI (1982) gave an additional locality for "*P. dahlii*" in Hokkaido and suggested possible occurrence of *P. coniferarum* in Honshu, Japan. HARA (1994) recently reported the occurrence of "*Pleroneura* sp." causing damage to the shoots of *Picea glehnii* stands in Hokkaido. These are the only original information about the genus in East Asia published to date.

In the present work, an attempt was made to revise the East Asian species of *Pleroneura*, although the material used was quite limited. Apart from a long series of specimens from Hokkaido, only six specimens have been available from East Asia; a female and a male from central Honshu, a female and a male from Kyushu, a female from North Korea and a male from Tibet. Of these, a male from Hokkaido and the Korean female are old specimens once recorded by TAKEUCHI (1938) as "*P. dahli*", and the Kyushu pair is the type series of *P. hikosana* TOGASHI, 1972. In conclusion, the following four species have been recognized in East Asia: *P. piceae* SHINOHARA et HARA, sp. nov., from Hokkaido, Japan, *P. subulata* SHINOHARA, sp. nov., from Honshu, Japan, and Korea, *P. hikosana* TOGASHI from Kyushu, Japan, and *P. atra* SHINOHARA, NAITO et HUANG, sp. nov., from southeastern Tibet.

The following abbreviations are used in the text for the depository of the material: HFRI-Hokkaido Forestry Research Institute, Bibai; KU-Faculty of Agriculture, Kobe University, Kobe; KYU-Faculty of Agriculture, Kyushu University, Fukuoka; NSMT-Department of Zoology, National Science Museum, Tokyo; UOP-College of Agriculture, University of Osaka Prefecture, Sakai; ZIB-Zoological Institute, Academia Sinica, Beijing.

Genus *Pleroneura* KONOW

[Japanese name: Maru-naginata-habachi Zoku]

Pleroneura KONOW, 1897, p. 56; SMITH, 1978, p. 17; SCHEDL, 1978, p. 104; OKUTANI, 1982, p. 20; GOULET, 1992, p. 32, 36. Type species: *Xyela dahlii* HARTIG, 1837 (subsequent designation

by ROHWER, 1911).
For synonymy and more references, see SMITH (1978).

Adult. Length 4–8 mm in female (excluding sawsheath), 4–7 mm in male (excluding protruding genitalia). Head and thorax with fine, dense punctures, usually opaque to moderately shining; abdomen coriaceous, moderately shining. Anterior margin of clypeus subtriangularly produced medially into obtuse or rounded apex. Antennal filament (all flagellar segments except 1st) normally 9-segmented, much shorter than 1st flagellar segment (ratio usually 0.6–0.8: 1 in female and 0.7–0.9: 1 in male). Maxillary palpus very large, with 3rd segment much longer than antennal scape. Tarsal claw with or without a subapical tooth. Wing membrane smooth, densely pubescent; forewing with Sc vein short, free throughout its length, with both branches (Sc1 and Sc2) distinct; Sc vein joining R vein before the point of separation of Rs vein; stigma rather elongate, about as long as or a little shorter than 2r crossvein; Rs and M veins usually not fused directly (1r–m crossvein present) but sometimes fused at one point or fused to form very short Rs+M vein; Rs1 and Rs2 veins usually branching before but close to origin of 2r–m crossvein. Second to 6th (or 7th) abdominal terga with longitudinal furrow above spiracle. Sawsheath narrow, pointed at its apex and more or less curved up. Male genitalia strophandrous (twisted through 180°); penis valve usually with one apical filament.

The interspecific anatomical differences in adults have been found mainly in color pattern, surface sculpture of the mesoscutum, presence or absence of the subapical tooth on the tarsal claw, structure of the sawsheath in females, and shape of the subgenital plate and penis valve in males.

KONOW (1897), ENSLIN (1917) and SCHEDL (1978) included "simple tarsal claws" in the generic diagnosis of *Pleroneura*, and two North American species examined (*P. californica* (ASHMEAD, 1898) and *P. aldrichi* ROSS, 1932) actually have simple tarsal claws (Fig. 4 I). However, all the four Asian species treated in this paper as well as *P. numidica* from North Africa (see BENSON, 1940) have a small subapical tooth on the tarsal claw (Fig. 4 H).

SMITH *et al.* (1977) divided the five Nearctic species into two groups by relative length of the sawsheath. *Pleroneura koebelei* ROHWER, 1910, and *P. lutea* ROHWER, 1910, have a comparatively short sawsheath, which is about 3/4 the length of the hind tibia, whereas the remaining three species have a longer sawsheath, which is subequal in length to or longer than the hind tibia. Of the Palearctic representatives, only *P. numidica* has a long sawsheath (BENSON, 1940), and the others, including all East Asian species, have a short sawsheath.

Larva. According to SMITH (1967, 1970) and OHMART and DAHLSTEN (1977), larvae of *Pleroneura* are characterized as follows: Late instar about 4.5–9 mm in length; body short and stout, widest in the region of the first

abdominal segment and slightly tapered towards each end; body and thoracic legs without sclerotized plates or setae; ocularium situated at the ventrolateral margin of the antacoria; 1st antennal segment without setae; mouth parts usually darkly sclerotized; labrum with narrow central emargination; inner tooth of each mandible truncate; spines of epipharynx arranged in a transverse, arcuate row; lacinia of maxilla with 6 to 8 spines, without a large central tooth; tarsal claw absent; 1st to 8th abdominal segments each with 3 dorsal annulets; microsetae on venter of abdomen scattered over entire surface; prolegs each reduced to short, blunt swellings; setiferous subanal protuberances absent.

Host plant. Larvae of five Nearctic species are all shoot borers in *Abies* spp. (SMITH *et al.*, 1977) and probably so are the three western Palearctic species (BENSON, 1940; SCHEDL, 1978). Of the four eastern Palearctic species, host is known only for one species, *P. piceae* sp. nov. described in this paper, which, as larva, bores in the shoot of *Picea glehnii* (HARA, 1994). Larvae of *Xyela*, the only extant genus of the subfamily Xyelinae other than *Pleroneura*, feed on developing pollen of the male strobili of *Pinus* spp. (SMITH, 1990).

Biology. WEBB and FORBES (1951), SMITH *et al.* (1977) and OHMART and DAHLSTEN (1977, 1978, 1979) studied biology of the fir-feeding Nearctic species, and HARA (1994) reported on the spruce-feeding Japanese species. Mainly after OHMART and DAHLSTEN (1977) and HARA (1994), the general life cycle may be summarized as follows: The adults appear in the spring, when buds of the host conifer are growing. After mating, the female deposits one egg each in the bud. The larva first bores its way to the apex of the embryonic needle cluster, and then, from the apex, bores down the central portion of the shoot. With five instars, the larva matures in about 20 days. When matured, it comes out from the shoot, chewing a hole in its side, drops to the ground and enters the soil. It overwinters as a larva or a pupa in an underground earthen cell about 4–8 in. deep (OHMART & DAHLSTEN, 1977) or 0–20 cm deep from the bottom of litter (HARA, 1994). Process of development underground is little known. OHMART and DAHLSTEN (1977) and HARA (1994) respectively suggested that at least some individuals spend more than one winter in the soil, thus taking two or more years to complete one generation, since the former authors found several larvae in the soil after the adults had emerged and the latter author found both larvae and pupae in the soil both in April and September.

Pleroneura piceae SHINOHARA et HARA, sp. nov.

[Japanese name: Maru-naginata-habachi]

(Figs. 1 A–D; 2 A; 4 A, D, H)

Pleroneura dahlii: TAKEUCHI, 1938, p. 204 (*dahli*!); TAKEUCHI, 1955, p. 112, fig. 741 on pl. 51

(*dahli*!); KIM, 1963, p. 266, 277 (*dahli*!); KIM, 1970, p. 121, 715 (*dahli*!); MÓCZÁR & ZOMBORI, 1973, p. 15 (*Dahli*!); SMITH *et al.*, 1977, p. 762 (*dahli*!); SMITH, 1978, p. 19; OKUTANI, 1982, p. 20, 21; ABE & TOGASHI, 1989, p. 541. [*Nec* HARTIG, 1837; *partim.*]
Pleroneura sp.: HARA, 1994, p. 13.

Female (paratopotype). Length (excluding sawsheath) about 4.9mm. Head black, with broad anterior margin of clypeus and very narrow ventral margin of malar space pale yellow; antenna dark brown to blackish brown, with scape and pedicel slightly paler; mouth parts mostly pale brown. Thorax black, with pronotum (except for rather obscure blackish dorsal marking) reddish brown, tegula dark brown (marginally pale), and most of cervical sclerite and most of metapleuron dark chocolate brown. Legs pale brown, with each coxal basis, each femur, hind tibia and each tarsus somewhat blackish. Wings uniformly lightly stained with blackish brown; veins and stigma translucent, blackish brown, the latter becoming paler posteriorly. Abdomen black, with lateral part of each tergum somewhat brownish, and caudal part, including lateral part of 7th tergum, narrow posterior margin and lateral part of 8th tergum, 9th tergum and 8th sternum entirely, and basal plate of sawsheath

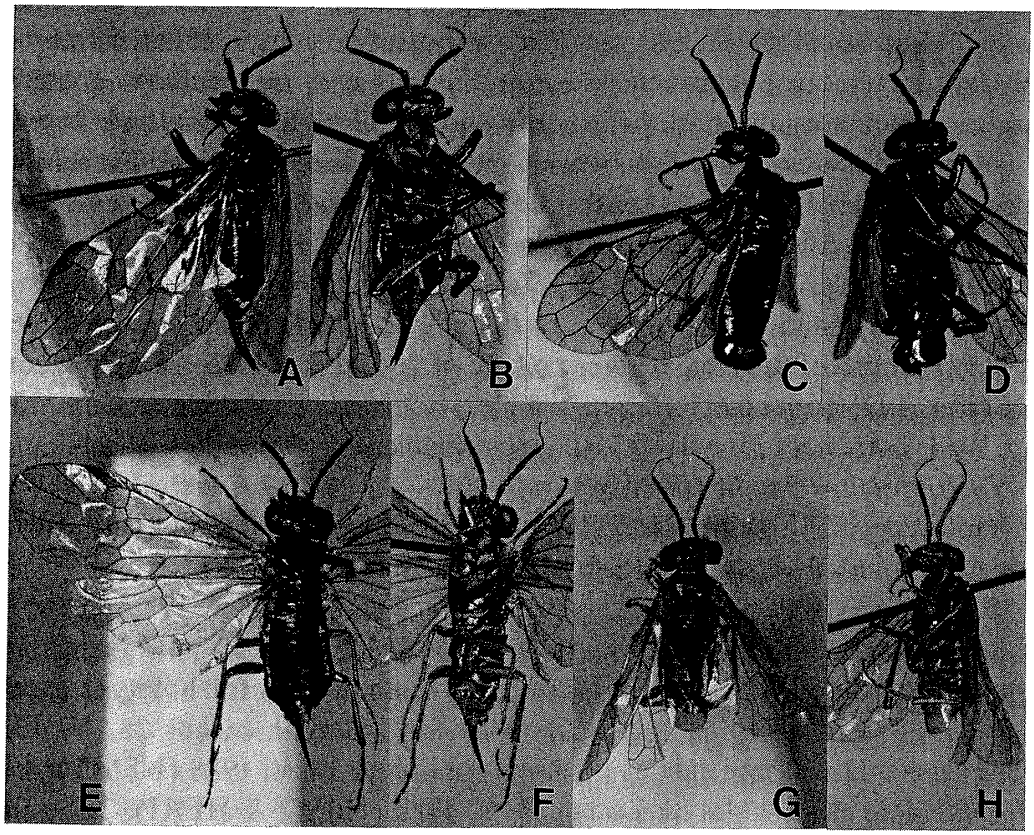

Fig. 1. *Pleroneura piceae* SHINOHARA et HARA, sp. nov. (A–D) and *P. subulata* SHINOHARA, sp. nov. (E–H). A, B, Female, paratopotype; C, D, male, holotype; E, F, female, paratype, Meotobuchi spa; G, H, male, holotype.

(apical part pale yellowish) pale reddish brown; sawsheath black, slightly brownish apically.

Mesoscutal lateral lobe dull between punctures, feebly shining. Tarsal claw with one small subapical tooth (Fig. 4 H). Forewing with short 1r–m crossvein; Rs1 and Rs2 veins branching before origin of 2r–m crossvein, and distance between separation of Rs1 and Rs2 and origin of 2r–m about 1/5 length of distance between origin of 2r and that of 2r–m. Sawsheath (Fig. 2 A) robust, in lateral view, weakly convex dorsally before middle, slightly upturned, about 0.71 times as long as hind tibia.

Male (holotype). Length (excluding genitalia) about 4.9 mm. Head black, with broad anterior margin of clypeus and very narrow ventral margin of malar space pale yellow; antenna pale brown, with scape and pedicel blackish; mouth parts mostly pale brown. Thorax black, with narrow ventral and anterior margins of pronotum brown and tegula dark brown, marginally pale. Legs pale brown, with each coxa (except for apex and part of ventral surface) black, part of each femur (posterior one more extensively) blackish, and each tarsus slightly darkened. Wings uniformly lightly stained with blackish brown; veins and stigma translucent, blackish brown, the latter becoming paler posteriorly. Abdomen black, with very narrow posterior margin of lateral part of each tergum (more extensively in ventral part), and very narrow posterior margin of each sternum dark brown and subgenital plate entirely pale brown.

Mesoscutal lateral lobe dull between punctures, feebly shining. Tarsal claw with one very small subapical tooth. Left forewing with Rs and M veins fused at one point whereas right one with the two veins not fused but connected by short 1r–m crossvein; Rs1 and Rs2 veins branching before origin of 2r–m crossvein, and distance between separation of Rs1 and Rs2 and origin of 2r–m about 1/3 length of distance between origin of 2r and that of 2r–m. Subgenital plate (Fig. 4 D) with apical margin distinctly convex in dorsal view; penis valve (Fig. 4 A) extremely long, with one apical filament.

Distribution. Japan (Hokkaido).

Holotype: ♂, Bibai [141°52′E, 43°20′N], Sorachi, Hokkaido, swept from *Picea glehnii* MASTERS, 18. V. 1988, H. HARA (NSMT).

Paratypes: 1♀, same data as for holotype except 10. V. 1985 (NSMT); 1♂, same data as for holotype except 10. V. 1988 (NSMT); 5♀, 4♂, same data as for holotype (NSMT & HFRI); 2♀, 2♂, same data as for holotype except 21. V. 1988 (NSMT); 1♀, same data as for holotype except 28. V. 1988 (NSMT); 5♀, 1♂, same data as for holotype except 30. V. 1988 (NSMT); 4♀, 4♂, same data as for holotype except 31. V. 1988 (NSMT & HFRI); 3♂, same data as for holotype except 1. VI. 1988 (NSMT); 5♀, 5♂, Asahikawa, Kamikawa, 24. V. 1990, K. KAMIJO (NSMT & HFRI); 1♂, "13. VII. 1931/ Mt. Daisetsu/TAKEUCHI" "*Pleroneura dahli* HARTIG/det. TAKEUCHI, '55"

(UOP); 1♀, "Souunkyo [Mts. Daisetsu-zan]/Hokkaido/VI. 18. 1938/K. SATO" (NSMT); 1♀, Tenninkyo, Mts. Daisetsu-zan, Kamikawa, 29. VI. 1987, A. SHINOHARA (NSMT); 2♂, Shintoku, Tokachi, 16. V. 1992, H. HARA, emergence trap under *Picea glehnii* (NSMT); 1♂, same data except 18. V. 1992 (NSMT); 1♂, Yamada-onsen, 800 m, Tokachi, 18. VI. 1991, A. SHINOHARA (NSMT); 1♀, same data except 21–25. VI. 1992, A. SHINOHARA (NSMT); 1♀, Horoshika-toge, Tokachi, 25. VI. 1992, A. SHINOHARA (NSMT); 2♀, 1♂, same locality, 22. VI. 1993, A. SHINOHARA & H. HARA (NSMT); 1♀, Nukabira, Tokachi, 21–22. VI. 1993, A. SHINOHARA (NSMT); 1♂, "Mt. Upepesanke/20. VII. 1967/A. NAKANISHI" (KU); 1♂, Kami-Rawan, Ashoro, Tokachi, 20. VI. 1992, A. SHINOHARA (NSMT); 1♀, "Akan/H. KONO et C. WATANABE" "Oakan/10/VII 1928" (NSMT); 1♀, 1♂, "Akankohan spa/22. VI. 1958/Col. K. BABA" (KU); 1♀, 1♂, Oketo, Abashiri, 17. VI. 1992, A. SHINOHARA (NSMT).

Variation. The female ranges from 4.6 to 7.6 mm in length and the male from 4.5 to 6.6 mm. In females, the antennal scape, pedicel and basal part of the filament often become pale brown, exhibiting a contrast with constantly blackish first flagellar segment, and the mesopleuron sometimes becomes partly to almost entirely chocolate brown. The subapical tooth of tarsal claw is sometimes reduced in males, becoming very inconspicuous. In the forewing, the Rs and M veins are usually not fused directly (short 1r–m crossvein present) but sometimes fused at one point or fused to form a very short Rs+M vein. The distance between the branching point of Rs1 and Rs2 veins and the origin of 2r–m crossvein in the forewing is usually 1/5 to 2/5 as long as the distance between the origin of 2r crossvein and that of 2r–m crossvein; only a few abnormal specimens have the Rs1 vein interstitial with 2r–m crossvein or the Rs vein branches after the origin of 2r-m. In extended abdomens of larger specimens (in both sexes but especially gravid females), pale yellow intersegmental membrane is visible, hence segments appearing pale-margined. The sawsheath is about 0.71 to 0.83 times as long as the hind tibia.

Host-plant. Picea glehnii MASTERS (HARA, 1994).

Remarks. The female of this new species is well characterized by its reddish brown pronotum and robust sawsheath with slight convexity before middle on dorsal margin (Fig. 2 A) and the male by the roundly produced apical margin of subgenital plate (Fig. 4 D) and the extremely long penis valve (Fig. 4 A). *Pleroneura coniferarum* from Europe may be closely related to *P. piceae*, but the former has the body, including the pronotum, blackish brown (ENSLIN, 1917) and dorsal margin of the sawsheath is shallowly concave before middle (BERLAND, 1947, fig. 21).

Previous records of "*P. dahlii*" from Japan, first made by TAKEUCHI (1938), all refer to this new species. *Pleroneura dahlii,* therefore, should be

excluded from the faunal list of Japan.

As discussed above, this is the only *Pleroneura* species known to feed on *Picea*; all the other host records for the genus are from *Abies*. The life history of this species was recently outlined by HARA (1994), and a detailed study on the life history and immature stages will be made by the same author.

Pleroneura subulata SHINOHARA, sp. nov.

[Japanese name: Hime-maru-naginata-habachi]

(Figs. 1 E–H; 2 B, C; 4 B, E)

Pleroneura dahlii: TAKEUCHI, 1938, p. 204 (*dahli*!); TAKEUCHI, 1955, p. 112, fig. 741 on pl. 51 (*dahli*!); KIM, 1963, p. 266, 277 (*dahli*!); KIM, 1970, p. 121, 715 (*dahli*!); MÓCZÁR & ZOMBORI, 1973, p. 15 (*Dahli*!); SMITH *et al.*, 1977, p. 762 (*dahli*!); SMITH, 1978, p. 19; OKUTANI, 1982, p. 20, 21; ABE & TOGASHI, 1989, p. 541; KIM *et al.*, 1994, p. 216 (*dahli*!). [*Nec* HARTIG, 1837; *partim*.]

Female (paratype). Length (excluding sawsheath) about 4.6 mm. Head black, with clypeus (except for dorsal margin and dorsomedian part) and very narrow ventral margin of malar space pale yellow; antenna blackish brown, with inner and ventral part of flagellum becoming pale brown; mouth parts mostly pale brown. Thorax black, with narrow ventral and anterior margins of pronotum pale brown, cervical sclerite partly dark brown, and tegula pale brownish. Legs pale brown, with each coxa (except for apex and part of ventral surface), narrow ends of each of mid and hind trochanters and narrow apical margin of each of mid and hind trochantelli black. Wings uniformly very lightly stained with blackish brown; veins and stigma translucent, dark, straw-colored. Abdomen black, with the following areas pale brown: narrow posterior margin of lateral part of each tergum (more extensively in ventral part), narrow posterior margin of each of 2nd and 6th sterna, and caudal part, including narrow posterior margin and all lateral part of 8th tergum, most of 9th tergum (midbasally blackish), most of 7th sternum (laterobasally and mid-basally blackish), and entire basal plate of sawsheath; sawsheath black, dorsally and apically somewhat brownish.

Mesoscutal lateral lobe dull between punctures, feebly shining. Tarsal claw with one small subapical tooth. Forewing with short 1r–m crossvein; Rs1 and Rs2 veins branching before origin of 2r–m crossvein, and distance between separation of Rs1 and Rs2 and origin of 2r–m about 2/5 length of distance between origin of 2r and that of 2r–m. Sawsheath (Fig. 2 B) slender, slightly upturned, about 0.80 times as long as hind tibia.

Male (holotype). Length (excluding genitalia) about 4.0 mm. Head black, with clypeus (except for dorsal margin and dorsomedian part) and very narrow ventral margin of malar space pale yellow; antenna pale brown, with

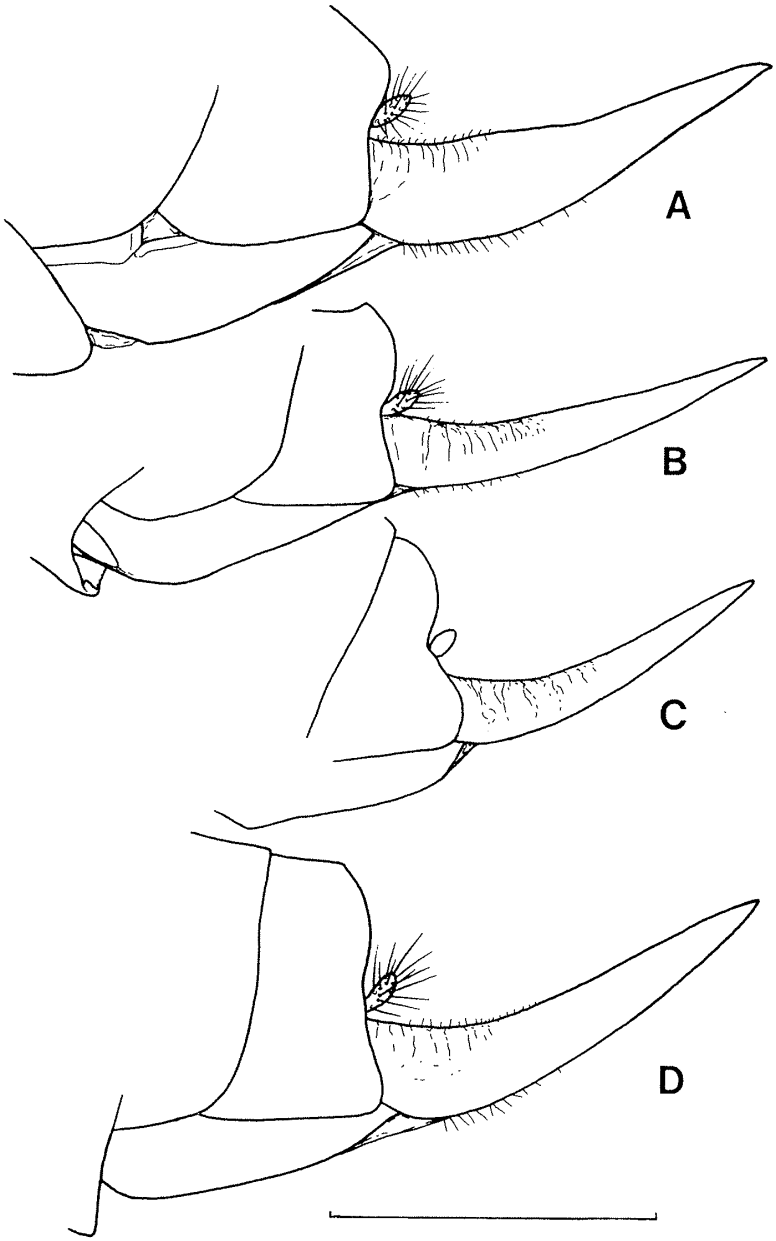

Fig. 2. *Pleroneura* spp., sawsheaths, lateral view. A, *P. piceae* SHINOHARA et HARA, sp. nov., paratopotype; B, *P. subulata* SHINOHARA, sp. nov., paratype, Meotobuchi spa; C, *ibid.*, paratype, Namsŏllyŏng; D, *P. hikosana* TOGASHI, holotype. Scale: 1 mm.

scape and filament somewhat blackish; mouth parts mostly pale brown. Thorax black, with narrow ventral and anterior margins of pronotum pale brown and tegula pale brownish (basally blackish). Legs pale brown, with each coxa (except for apex and part of ventral surface) blackish and each tarsus somewhat darkened; fading blackish rings at both ends of each of mid and hind trochanters and at apical margin of each of mid and hind trochantelli. Wings uniformly

very lightly stained with blackish brown; veins and stigma translucent, dark, straw-colored. Abdomen black, with narrow posterior margin of lateral part of each tergum (more extensively in ventral part), posterior margin of each sternum, and entire subgenital plate pale brown.

Mesoscutal lateral lobe dull between punctures, feebly shining. Tarsal claw with one small subapical tooth. Forewing with Rs and M veins fused to form very short Rs+M vein (1r–m crossvein absent); Rs1 and Rs2 veins branching before origin of 2r–m crossvein, and distance between separation of Rs1 and Rs 2 and origin of 2r–m about 1/4 length of distance between origin of 2r and that of 2r–m. Subgenital plate (Fig. 4 E) with apical margin truncate in dorsal view; penis valve (Fig. 4 B) of moderate length, with one apical filament (lost during the dissection, thus not figured).

Distribution. Japan (Honshu); Korea.

Holotype: ♂, Tokugo-tôge [137°41′E, 36°13′N] near Kamikôchi, ca. 2,100 m alt., Nagano Pref., 27. VI. 1976, A. SHINOHARA (NSMT).

Paratypes: 1♀, Meotobuchi spa [139°24′E, 36°52′N], Oku-Kinu, Tochigi Pref., 5. VI. 1973, A. SHINOHARA (NSMT); 1♀, "Nansetsurei [=Namsŏllyŏng or Sŏllyŏngbong (1,836 m alt.), 128°45′E, 41°17′N], 12. VI. 1936, TAKEUCHI" (UOP).

Variation. The paratype female from Korea, a poorly preserved specimen damaged by fungi, differs from the Japanese specimen described above as follows: length (excluding sawsheath) about 4.3 mm; antenna dark brown, with most of scape blackish; distance between separation of Rs1 and Rs2 and origin of 2r–m about 1/3 length of distance between origin of 2r and that of 2r–m; sawsheath (Fig. 2 C) slender, moderately upturned, about 0.74 times as long as hind tibia.

Host-plant. Unknown.

Remarks. This new species closely resembles the type species of the genus, *P. dahlii*, from Europe, as understood from the descriptions and keys by KONOW (1901–1905), ENSLIN (1917), and SCHEDL (1978). The female of *P. subulata* is barely separable from that of *P. dahlii*; only the presence of a small subapical tooth on the tarsal claw, very lightly infuscated wings, and the slightly thicker sawsheath (compare Fig. 2 B, C with fig. 1 in BENSON, 1940) may serve to distinguish the former from the latter.

The males of the two species, on the other hand, are readily distinguishable by the shape of the penis valve (compare Fig. 4 B with fig. 6 c in SCHEDL, 1978). In the holotype of *P. subulata*, only one penis valve had the apical filament when examined before dissection, but being very fragile, this filament was also lost during the treatment. The filament may become lost quite easily in *Pleroneura*. The penis valve of *P. dahlii* illustrated by SCHEDL (1978, fig. 6 c) has no apical filament, and if this absence is a specific character, it is

another useful feature for distinguishing *P. dahlii* from *P. subulata.*

The female paratype from Korea is the specimen recorded by TAKEUCHI (1938) from Korea under the name of "*P. dahli*". So far as I know, no additional Korean records of "*P. dahli*" have been published, and therefore this European species should be excluded from the Korean fauna.

Pleroneura hikosana TOGASHI

[Japanese name: Aka-maru-naginata-habachi]

(Figs. 2 D; 3 A–D; 4 F)

Pleroneura hikosana TOGASHI, 1972 a, p. 53; TOGASHI, 1972 b, p. 131; SMITH *et al.*, 1977, p. 762; SMITH, 1978, p. 19; OKUTANI, 1982, p. 20, 21; ABE & TOGASHI, 1989, p. 541.

Supplementary description. Mesoscutal lateral lobe dull between punctures, feebly shining. Tarsal claw with one small subapical tooth. Forewing

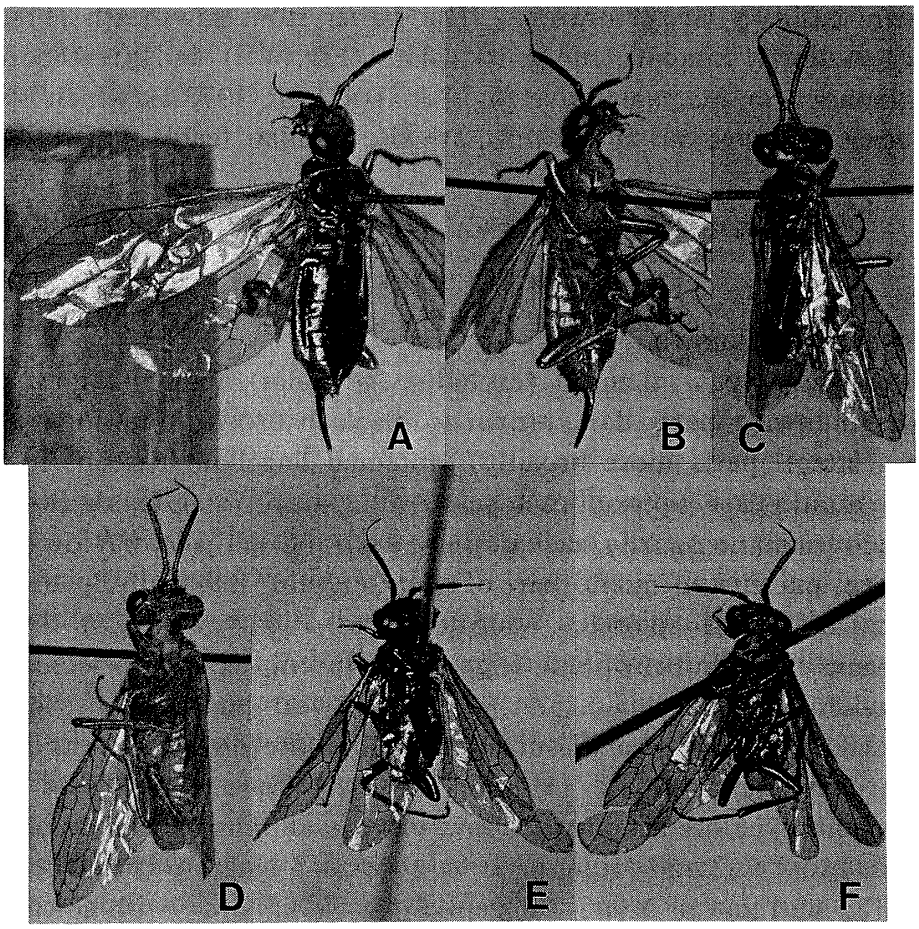

Fig. 3. *Pleroneura hikosana* TOGASHI (A–D) and *P. atra* SHINOHARA, NAITO et HUANG, sp. nov., male, holotype (E, F). A, B, female, holotype; C, D, male, paratopotype.

with short 1r–m crossvein; Rs1 and Rs2 veins branching before origin of 2r–m crossvein. Female: Length (excluding sawsheath) about 5.8 mm. Distance between separation of Rs1 and Rs2 and origin of 2r–m in forewing about 2/5 length of distance between origin of 2r and that of 2r–m. Sawsheath (Fig. 2 D) rather robust, moderately upturned, about 0.73 times as long as hind tibia. Male: Length (excluding genitalia) about 5.4 mm. Distance between separation of Rs1 and Rs2 and origin of 2r–m in forewing about 3/7 length of distance between origin of 2r and that of 2r–m. Subgenital plate (Fig. 4 F) with posterior margin shallowly concave in dorsal view. Penis valve not examined.

Distribution. Japan (Kyushu).

Material examined. ♀ (holotype), "Mt. Hikosan [130°56′E, 33°29′N], 29. IV. 1970, Malaise trap"(KYU); 1♂(paratype), "Mt. Hikosan, 30. IV. 1970, Malaise trap"(KYU).

Host-plant. Unknown.

Remarks. This is a large, pale-colored species separable from the other congeners easily by its coloration. The rather stout sawsheath (Fig. 2 D), apically shallowly concave subgenital plate (Fig. 4 F) and presence of two apical filaments on the penis valve (fig. 7 in TOGASHI, 1972 a), which is stouter than those of *P. subulata* and *P. atra*, are also peculiar features of this species.

Pleroneura atra SHINOHARA, NAITO et HUANG, sp. nov.

(Figs. 3 E, F; 4 C, G)

Female. Unknown.

Male (holotype). Length (excluding genitalia) about 3.9 mm. Black, with the following parts dark brown to blackish brown: anterior margin of clypeus (lateral parts more broadly), antennal flagellum (except for dorsal surface), mouth parts (apex of each palpus dull pale brown), tegula (marginally pale), each trochanter partly, each of tibiae and tarsi, and very narrow posterior and ventral margins of lateral part of each tergum. Subgenital plate translucent, very dark straw-colored. Wings uniformly lightly stained with blackish brown; veins blackish brown and stigma translucent, dark straw-colored.

Mesoscutal lateral lobe nearly polished between punctures, strongly shining. Tarsal claw with one small subapical tooth. Forewing with Rs and M veins fused to form very short Rs+M vein (1r–m crossvein absent); Rs1 and Rs2 veins branching before origin of 2r–m crossvein, and distance between separation of Rs1 and Rs2 and origin of 2r–m about 1/3 length of distance between origin of 2r and that of 2r–m. Subgenital plate (Fig. 4 G) with apical margin truncate in dorsal view; penis valve (Fig. 4 C) moderately long, with one apical filament.

Distribution. Tibet.

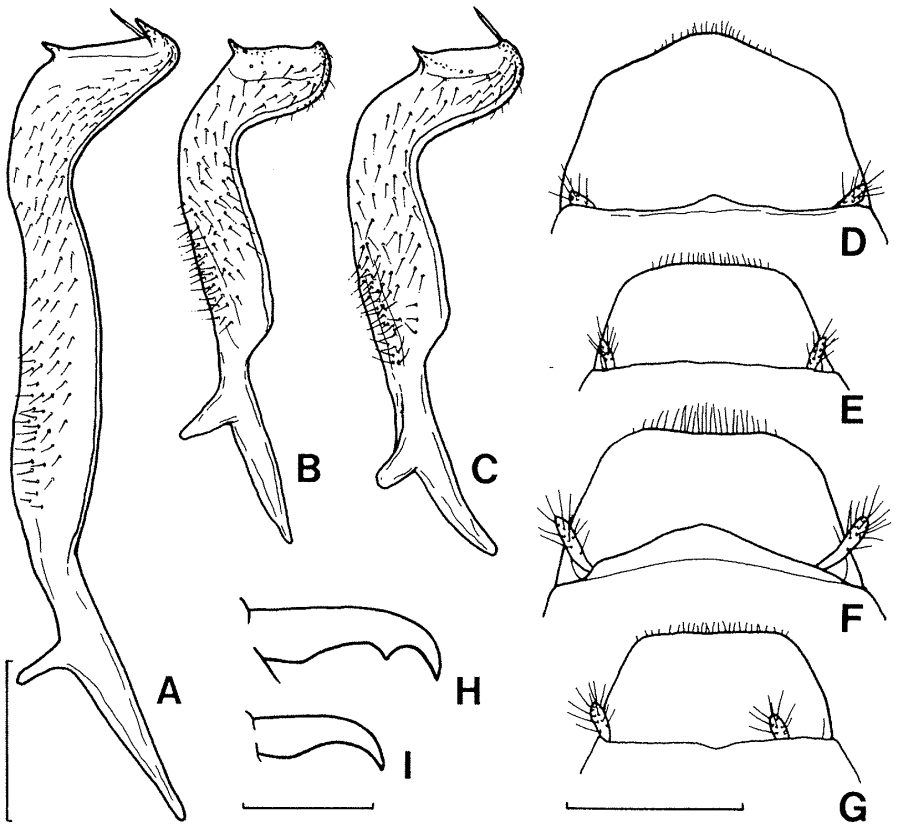

Fig. 4. *Pleroneura* spp., penis valve, lateral view (A–C), subgenital plate, dorsal view, genitalia removed (D–G), and tarsal claw, female (H, I). A, D, H, *P. piceae* SHINOHARA et HARA, sp. nov., paratopotype; B, E, *P. subulata* SHINOHARA, sp. nov., holotype; C, G, *P. atra* SHINOHARA, NAITO et HUANG, sp. nov., holotype; F, *P. hikosana* TOGASHI, paratopotype; I, *P. californica* (ASHMEAD), Lost Prairie, Oregon, U.S.A. Scales: 0.25 mm for A–C, 0.6 mm for D–G, and 0.125 mm for H, I.

Holotype: 1♂, "(China)/ Bomi [95°50′E, 29°45′N] 2700 m/ Tibet, Xiz./ 3. V. 1986/ T. NAITO" (ZIB).

Host-plant. Unknown.

Remarks. The male of this new species is well characterized by its dark coloration, nearly polished surface between punctures on the mesoscutal lateral lobes, truncate apical margin of the subgenital plate, and the shape of penis valve. Penis valves have been illustrated for other eight congeners (*P. dahlii* [fig. 6 c, SCHEDL, 1978], *P. piceae* [Fig. 4 A], *P. subulata* [Fig. 4 B], and five Nearctic species [figs. 10–14, SMITH *et al.*, 1977]), and among them, *P. atra* resembles *P. subulata* most closely. However, the former species differs from the latter in the somewhat longer "neck" of the penis valve (compare Fig. 4 C and B) as well as the body coloration and surface sculpture of the mesoscutal lateral lobes.

Key to East Asian Species

1. Head capsule largely and thorax and abdomen beneath entirely reddish yellow (Fig. 3 A–D). Female: sawsheath as in Fig. 2 D. Male: penis valve as in fig. 7, TOGASHI (1972 a) ..... *P. hikosana*
— Head capsule entirely black, except for anterior margin of clypeus and narrow ventral margin of malar space, and thorax and abdomen beneath mostly dark-colored (Figs. 1 A–H; 3 E, F) 2
2. Larger species, length 4.6–7.6 mm in female (excluding sawsheath) and 4.5–6.6 mm in male (excluding genitalia). Female: pronotum predominantly reddish brown; sawsheath robust (Fig. 2 A). Male: subgenital plate with apical margin roundly produced (Fig. 4 D); penis valve extremely long (Fig. 4 A) ..... *P. piceae*
— Smaller species, length 4.3–4.6 mm in female (excluding sawsheath) and 3.9–4.0 mm in male (excluding genitalia). Female: pronotum predominantly black; sawsheath slender (Fig. 2 B, C). Male: subgenital plate with apical margin truncate (Fig. 4 E, G); penis valve of moderate length (Fig. 4 B, C) 3
3. Mesoscutal lateral lobe dull between punctures, feebly shining; legs pale brown except for coxal bases. Female: sawsheath as in Fig. 2 B, C. Male: penis valve as in Fig. 4 B ..... *P. subulata*
— Mesoscutal lateral lobe nearly polished between punctures, strongly shining; legs mostly black and blackish brown. Male: penis valve as in Fig. 4 C. (Female unknown) ..... *P. atra*

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References

ABE, M., & I. TOGASHI, 1989. Xyelidae. *In* HIRASHIMA, Y. (ed. supervisor), *A Check List of Japanese Insects*, p. 541. (In Japanese.)

BENSON, R. B., 1940. A new species of *Pleroneura* KONOW (Xyelidae) from Algiers (Hymenop-

tera, Symphyta). *Proc. R. ent. Soc. Lond.*, (B) **9**: 39–40.

BENSON, R. B., 1945. Classification of the Xyelidae (Hymenoptera Symphyta). *Ibid.*, **14**: 34–37.

BERLAND, L., 1943. Les Xyelidae de France (Hym., Sessiliventres). *Bull. Soc. ent. Fr.*, **48**: 89–92.

———— 1947. Hyménoptères Tenthredoïdes. Faune de France, 47. 496 pp. P. Lechevalier, Paris.

ENSLIN, E., 1917. Die Tenthredinoidea Mitteleuropas VII. *Dtsch. ent. Z.*, **1917** (Beiheft): 663–790.

GOULET, H., 1992. The genera and subgenera of the sawflies of Canada and Alaska. Hymenoptera: Symphyta. *Ins. Arachn. Canada,* (20): 1–235.

HARA, H., 1994. [Notes on a xyelid sawfly injurious to *Picea glehnii*.] *Kôshunaikihô*, (96): 13–15. (In Japanese.)

HARTIG, T., 1837. Die Familien der Blattwespen und Holzwespen. XIV+416 pp, 8 pls. Berlin, Haude- und Spener'sche Buchhandlung.

KIM, C. W., 1963. Hymenoptera of Korea. *Humanit. Sci. (nat. Sci.), Korea Univ.*, **6**: 243-374. (In Korean.)

———— 1970. Illustrated Encyclopedia of Fauna and Flora of Korea, **11**(3). 891 pp. Samwha-Chulpansa, Seoul. (In Korean.)

————, J. W. LEE, J. S. PARK, B. J. KIM & J. C. PAIK, 1994. Hymenoptera. *In*: The Entomological Society of Korea & Korean Society of Applied Entomology, *Check List of Insects from Korea,* pp. 216–269. Kon-Kuk University Press, Seoul. (In Korean.)

KONOW, F. W., 1897. Über die Xyelini. *Ent. Nachr.*, **23**: 55–58.

———— 1901–1905. Systematische Zusammenstellung der bisher bekannt gewordenen Chalastogastra, 1. *Z. syst. Hym. Dipt.*, 1–5. 376+XI pp.

MÓCZÁR, L., & L. ZOMBORI, 1973. Levéldarázs-Alkatúak I.—Tenthredinoidea I. *Fauna hung.*, (111): 1–128.

OHMART, C. P., & D. L. DAHLSTEN, 1977. Biological studies of bud mining sawflies, *Pleroneura* spp. (Hymenoptera: Xyelidae), on white fir in the central Sierra Nevada of California. I. Life cycles, niche utilization, and interaction between larval feeding and tree growth. *Can. Ent.*, **109**: 1001–1007.

———— & ———— 1978. *Ibid.* II. Larval distribution within tree crowns. *Ibid.*, **110**: 583–590.

———— & ———— 1979. *Ibid.* III. Mortality factors of egg, larval, and adult stages and a partial life table. *Ibid.*, **111**: 883–888.

OKUTANI, T., 1982. [Symphyta of Japan IV.] *Nature Insects,* **17**(9): 19–21. (In Japanese.)

ROHWER, S. A., 1911. II. The genotypes of the sawflies and woodwasps, or the superfamily Tenthredinoidea. *U. S. D. A., Bur. Ent. tech. Ser.*, (20): 69–109.

SCHEDL, W., 1978. Die Xyelidae Europas (Insecta: Hymenoptera, Symphyta, Xyeloidea) mit besonderer Berücksichtigung der Fundnachweise aus den Ostalpen. *Berich. nat.-med. Ver. Innsbruck,* **65**: 97–115.

SMITH, D. R. 1967. A review of the larvae of Xyelidae, with notes on the family classification (Hymenoptera). *Annals ent. Soc. Am.*, **60**: 376–384.

———— 1970. A new Nearctic *Xyela* causing galls on *Pinus* spp. (Hymenoptera: Xyelidae). *J. Georgia ent. Soc.*, **5**: 69–72.

———— 1978. Suborder Symphyta (Xyelidae, Pararchexyelidae, etc.). *In* Van der VECHT, J., & R. D. SHENEFELT (eds), *Hymenoptm. Cat.* (nov. ed.), (14): i–vi+1–193.

———— 1990. A new *Xyela* (Hymenoptera: Xyelidae) from western United States. *Ent. News,* **101**: 9–12.

SMITH, D. R., C. P. OHMART & D. L. DAHLSTEN, 1977. The fir shoot-boring sawflies of the genus *Pleroneura* in North America (Hymenoptera: Xyelidae). *Annals ent. Soc. Am.*, **70**: 761–767.

TAKEUCHI, K., 1938. A systematic study on the Suborder Symphyta of the Japanese Empire (I). *Tenthredo*, **2**: 173–229.

———— 1955. Colored Illustrations of the Insects of Japan, 2. 190 pp, 68 pls. Hoikusha, Osaka. (In Japanese.)

TOGASHI, I., 1972 a. Sawflies of Mt. Hiko, Kyushu (Hym., Symphyta). *Mushi, Fukuoka*, **46**: 53–64.

———— 1972 b. A note on the seasonal occurrence of sawflies (Hym., Symphyta) on Mt. Hiko, Kyushu. *Ibid.*, **46**: 129–135.

WEBB, F. E., & R. S. FORBES, 1951. Notes on the biology of *Pleroneura borealis* FELT (Hymenoptera: Xyelidae). *Can. Ent.*, **83**: 181–183.

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